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Power to the People:

Local community initiatives and the transition to sustainable energy

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Abstract

The transition towards renewable and sustainable energy is being accompanied by a transformation of communities and neighbourhoods. This transition may have huge ramifications throughout society. Many cities, towns and villages are putting together ambitious visions about how to achieve 100% sustainable energy, energy neutrality, zero carbon emission or zero-impact of their communities. We investigate what is happening at the local community level towards realizing these ambitions from a social perspective. We use the case study approach to answer the following question: How do local community energy initiatives contribute to a decentralized sustainable energy system? We find that especially the development of a shared vision, the level of activities and the type of organisation are important factors of the strength of the 'local network'.

Keywords: decentralized energy production; energy initiatives; citizen groups; energy neutrality; sustainable energy; prosumers

Power to the People:

Local community initiatives and transition to energy sustainability

Highlights

- Local community energy initiatives in the Netherlands are investigated from a social science perspective.
- Actor Network Theory is used as the frame of reference.
- It appears that the development of a shared vision, the level of activities and type of organisation are critical for the strength and success of initiatives.
- Community initiatives' success depends on the quality of their networks.

1. Introduction

The social impact of renewable energy systems is potentially quite different from that of conventional (fossil-based) systems [1]. More specifically, renewable energy production offers opportunities for the local governance of energy production, in contrast to the much more centralized conventional energy production. Many communities and regions have expressed goals to transform their community to a self-sufficient renewable energy system. Thus, the societal transition to a sustainable energy system may also lead to the social transformation of communities and neighbourhoods [2,3]. This transformation of energy production towards a more sustainable and decentralized system is progressing very slowly in the Netherlands. According to Eurostat, renewable energy capacity in the EU-27 makes up 8.7 per cent of the total, but that of the Netherlands is just 3.6 per cent¹. In Europe only the UK and Luxembourg perform worse in this respect. Hence, this makes the Netherlands a particularly interesting case, especially because the lagging position seems to be related to 'soft' issues, as the technology is already freely available. For example, Dutch fiscal policies are at present far from conducive to small producers and the national energy policy appears to be one of the major barriers to change [4]. Large energy companies voiced the opinion that the Dutch will have to temporize renewable energy. They fear that otherwise their recent investments in large coal and gas-fired power plants will not become economically profitable. Furthermore, they argue that an exorbitant growth of renewables will reduce necessary back up capacity (The Economist, October 12th 2013). However, this mainly reveals that they are rather slow in adapting their business model. As a result, the value of their business has been reduced dramatically over the past couple of years. The incumbents view renewable energy resources as a threat to their business model especially because the marginal costs of the renewables are way below those of fossil fuels [5]. The opposition of energy companies to the energy transition is an example of the role of vested interests in the energy industry, as suggested by Moe [6].

On the other hand, many cities, towns and villages in the Netherlands have put together ambitious visions about how to become energy neutral, zero-emission or low carbon communities. Almost 500 local initiatives were counted in 2014 (www.hieropgewekt.nl). Their challenge is to turn these ambitions into reality. In this paper, we will particularly focus on the bottom-up approaches to realize the local community transition to energy sustainability from a social sciences perspective. We are very well aware of the fact that this social perspective is not encompassing. There are several technological issues that play a crucial role here. Especially, the development of energy storage systems as "buffer" between demand and supply is the highest priority to make renewables grow significantly. Furthermore, distributed grid management is under development to account for any short-term intermittency. Several countries try to care for decentralized production, with an obligation of power providers to accommodate the decentralized supply in the grid. In addition, local community initiatives often face the problem of construction and operation permits, required maintenance and other aspects related to decentralized production. Furthermore, apart from community initiatives, there also are local initiatives undertaken by municipalities and NGOs.

The idea that an electricity network should rely on central production in large plants situated far from individual consumers has taken hold only in the last decades [9]. Started out as small, municipally governed production facilities, energy producers have become ever-larger companies. At the same time, the governance of energy production has gone from the hands of local and regional governing bodies to international energy companies, like the German *Rheinisch-Westfälische Elektrizitätswerke* (RWE) AG and

¹ Source: Eurostat (online data codes: nrg_100a, nrg_1071a and nrg_1072a)

the Swedish *Vattenfall* (see also [10]).² Consequently, the influence of consumers, local and regional politics on energy generation has become virtually non-existent. Therefore, the recent mushrooming of energy co-operations on a town- or even village-scale may seem quite remarkable set against the background of the international centralized energy system. However, in part, it also reveals a ‘back to basics’ of energy production. Due to technological innovations in especially renewables generation, small-scale generation and individual choice for green energy has become available at almost the same moment in time [11]. In the liberalized EU energy market, consumers can freely choose their energy provider, so they can ‘vote with their wallet’ [12]. Moreover, consumers can become producers or ‘prosumers’ by producing energy with their own combined heat and power installations, solar panels or windmills. This has become an attractive option for a growing group of consumers and small to medium sized enterprises. From these economic activities, we witness the development of social networks that relate to energy [13]. They are involved in scaling up from the individual to the community level. In this respect, the affix ‘prosumers’ can be applied to this development of decentralized energy production [7]. Local community energy initiatives foster and stimulate this development [8]. More specifically, they engage with institutionalizing and establish energy-cooperatives and similar organizations, which distribute energy to their own community or region. This community option is becoming serious business, as is shown by the already considerable and growing amount of local community energy initiatives that are taking off in several European countries in the past few years [13-15]. We seek to understand the drivers behind this surge of community activity. The literature suggests that the provision and promotion of green electricity, the strengthening of social cohesion and the investment of revenues in the local community are strong motivations for these initiatives [16]. In addition, many people voice ideas about self-empowerment and autarky, wishing to become independent from large and international energy companies [17].

We will analyse the activities of these initiatives and especially investigate the potential of their effectiveness and impacts regarding the creation of a sustainable local energy community. The key question we ask is: How do local community energy initiatives contribute to a decentralized sustainable energy production system? To this extent, we investigate the activities, motives and ambitions of local community energy initiatives, what determines their effectiveness, and the barriers they encounter. We expect that this will help us to arrive at a better understanding of the position and possibilities of local community energy initiatives.

With our study, we aim to contribute to the literature in three ways. First is that we expand the teamwork literature by investigating the hitherto uncovered local energy initiatives. So far, most research on teamwork is carried out regarding formal organizations; therefore we chose to include the model of Gartner [18,19] in our analysis, as this explicitly covers emerging organisations. Second is that we use Actor-Network Theory [20,21] and the Pentagram model [22] to analyse how local energy initiatives are related to more overarching networks. So far, these two analytical frameworks have not been used to investigate these entities: Nijkamp and Ursem [22] primarily focuses on large cities, whereas Jolivet et al. [21] describe a commercial initiative. Third is that this is the first empirical study after local community energy initiatives in the Netherlands. The latter is of interest given the relatively small share of renewable energy in the current Dutch energy system as was mentioned before.

The remainder of this article is organized as follows. Section 2 provides the theoretical background for our analysis. The methodology and data used is introduced in Section 3. Section 4 presents and discusses the results. Section 5 concludes.

² A thorough assessment about the changing role of some of the major European energy companies in relation to renewable and sustainable energy is provided by Kungl [71].

2. Background regarding approaches of social aspects of energy transitions

Here, we discuss different theoretical approaches of social aspects of energy transition. There are several theoretical approaches that might help explain the realities of energy policy and local activism. In this section we briefly highlight studies of local energy transformations, which respectively take social acceptance as starting point, focus on technological innovation processes, concentrate on grass-roots innovation, or investigate municipal energy plans. Theoretical lenses used in these approaches include path creation, multi-level perspective (MLP), and Actor-Network Theory. We conclude with motivating our choice for Actor-Network Theory as the basis for our empirical analysis.

Social acceptance

Individual citizens as energy users, or as homeowners, have attracted the attention of researchers. Often citizens are studied in the framework of social acceptance of renewable energy, in this literature willingness to invest in energy efficiency measures by homeowners, plays an important role (see Perlaviciute and Steg, 2014, [23] for an overview). On the other hand, citizen resistance e.g. to the siting of windmills, has attracted academic interest too. Resistance to renewable energy projects is often studied in the frame of NIMBY-ism, such as the study of CCS in the North of the Netherlands [24]. Wüstenhagen et al. [26] conceptualize social acceptance, identifying three categories of acceptance: socio-political, community and market acceptance. According to Bidmon and Knab [25], energy transitions could be substantially improved by including non-technological innovations, such as new business models. Their conceptual discussion underpins the importance of appropriate business models in order to further develop niches. This links to the need of market acceptance as discussed in Wüstenhagen et al. [26]

Against this background our subject can be placed in the category of community acceptance. The cases in our sample have moved from passive acceptance to active engagement. Therefore, our paper studies the processes behind the realization of sustainable energy projects by local community initiatives.

Path creation

From innovation literature the concept of path creation seems promising to analyse barriers and incentives in the energy transition [27]. This idea draws on the metaphor of a development path, which guides and restricts the development of technologies. To create a new path involves a lot of risks in investing financial, human and knowledge resources in new technologies [28]. How can we interpret the activities of citizens initiatives against the background of path creation? Here the concept of niches as proposed in the MLP framework could be of assistance. MLP has shown to be very productive regarding its application to technological developments, especially in the field of energy. The route for influencing the energy system according to the MLP is by protecting and managing niches. In these protected spaces technological innovation is supported by for example subsidies or tax incentives and regulations. As such, the technological innovations are set apart until the products can compete on their own. Emerging energy technologies on the local level were analysed by Raven et al. [29]. According to Hielscher et al. and Hargreaves et al., local initiatives can be seen as niches, which are set quite apart from the business-as-usual or conventional ways of operating in the economy [30-32]. An in-depth analysis of the usefulness of the niche-concept for grass-roots initiatives is detailed by Seyfang and Longhurst in a study after currency initiatives [33] [28,34]

Grass roots innovation

Studies of grass roots transformation show that grass-roots or bottom up transitions have their source in local networks of engaged citizens, who are moral agents. Kirkman [34] argues that moral agents make ethical choices, but are hindered by 'limits of agency'; barriers are present both in cultural and political traditions and in the physical layout of our built environment. Examples of barriers are shown and discussed in [35-37]. We aim to develop an approach that accounts for the bottom up path-creation by local networks of moral agents. To this extent, we will rely on Actor-Network Theory. Here, socio-technological phenomena are interpreted as heterogeneous networks, made up of human actors and non-human actors such as technological devices. Law and Callon [38] propose that the level of 'success' of a project is a function of the degree of mobilization of local actors and the degree of attachment of actors in the global network. For example, Hauber and Ruppert-Winkel in an in-depth study of three rural regions in Germany with strong ambitions to develop towards energy self-sufficiency, find that social, market as well as technological aspects are included [39]. They identify three phases in the development of these regions: pioneer phase, pivotal network phase and extended network/ growing market phase. Previous research on community energy particularly has been done after the UK; following the publication of a UK policy document entitled *Local Energy Communities*. Especially Walker and Devine-Wright have published on this topic [13,15,16]. For Germany, several studies [40,41] relate to qualitative psychological factors regarding energy initiatives by the public. Walker et al. [42] argue that the level of acceptance of energy production units is stronger when the unit is more open, participatory, local and collective. An important factor in this model is 'trust'; members of the local community have to trust the local initiative in order to support, or at least not oppose, the projects that this initiative wants to undertake [15]. The absence of trust often leads to opposition to sustainable energy projects, as is shown in a number of studies into siting of windmills [21,43]. Then, it seems important to investigate which factors might influence 'trust'. In our cases we specifically look at internal trust, because the literature on advocacy groups – primarily undertaken for the US – suggests that teamwork and internal democracy are important factors that influence the effectiveness of these groups [44]. On top of this, our research takes up findings on leadership and teamwork [45], which we apply to the local community energy initiatives.

Municipal energy plans

Several case studies have investigated the role of local government in (renewable) energy planning. For example, St. Denis and Parker compared the energy plans from 10 Canadian communities, ranging in size from 500 to 956.000 inhabitants [46]. They observe that renewable energy is not a priority in these plans, rather they focus on energy efficiency and conservation. With regard to renewables these plans primarily focus on education and awareness-raising, with a view to raise the acceptance of renewable energy technologies. A second aspect is that municipalities undertook activities to lead by example: implementing solar technologies in buildings, or using bio-fuels for municipal vehicles. Citizen participation in the formulation and implementation of these plans appear rather limited, although consultations took place. The municipal energy plans in this study apparently did not allow for active citizen engagement.

Furthermore, Nijkamp and Ursem [22] study municipal policies to promote sustainable energy in European cities. They identified five factors that are crucial in attaining successful implementation of local energy measures: technology; communication; social conditions; financial requirements and organization. Martenson and Westerberg [47] present three qualitative case studies of municipal bio-energy systems in Sweden. In their study they re-construct the local processes in order to compare strategic models for energy transformation, sub-processes problem formulation, mobilization and communication are identified. On the basis of their findings they come up with three strategic models that could be used as a tool for

municipalities that want to embark on an energy transformation process. Recently, Slee investigates the roles of community ownership in on-shore wind energy in Scotland. He argues this development can empower communities as well as deliver on governmental energy goals. Furthermore, the analysis of Slee might provide a bridge between governmental policies and community initiatives.[72]

In our study, we will apply the literature about local networks to local energy initiatives. We use a conceptual model based on Callon and Law to analyse local energy initiatives in the Netherlands. These initiatives may be ‘forming new centres for change’ [34], according to Kirkman, who expects that widespread changes can occur once local networks team up on a national or global scale. Therefore, we propose to analyse the networks of moral agents as the locus of agency. We relate to our empirical research on local energy communities that is explained in the next section.

When analysing local community energy initiatives (in essence non-profit grassroots organizations) we want to find out if the non-technological challenges they face mirror the factors recognized in St. Denis and Parker [46] and Nijkamp and Ursem [22], who analyse at the level of municipalities and cities respectively. More specifically, these energy initiatives face financial challenges, such as finding sufficient funding. Organizational challenges include safeguarding continuity, exercising effective team leadership, and attracting membership. Furthermore, they require regular communication with their local environment and securing municipal and/or regional support. Especially legal procedures can be rather complicated for non-experts. In addition, the projects face construction and operation permits, and how to manage required maintenance. Also, the members of these initiatives have to familiarize themselves with technological options. But, as already mentioned before, the latter are not investigated in this study.

3 Method

Case study

In order to investigate local community energy initiatives in more depth we rely on a case study approach. According to Yin, (ref. 1994) case studies facilitate the search for conceptual patterns and categories, which helps to understand a certain phenomenon. As defined by Simons 2009: ‘*case study is an in-depth exploration from multiple perspectives of the complexity and uniqueness of a particular project, policy, institution, program or system in a ‘real-life’ context* (p.21). (cited by Thomas, 2011 [48]) The choice of cases aims at the inclusion of a wide array of qualitative aspects, to be able to study as much relevant patterns as possible. This process is called strategic selection and is introduced by Glaser and Strauss, 1967, Strauss and Corbin, 1998, and Flyvbjerg, 2001, among others. [49-51]. The number of cases is usually very limited, in the literature used for this paper we find between two and ten cases. For example, case studies by Hauber and Ruppert-Winkel [39], Martensson and Westerberg [47], Arentsen and Bellekom [53], Viardot et al. [54], as well as by [55-59], while Saunders et al. study two cases of innovative finance for community energy [60].

Therefore, case studies do not lend themselves to statistical analyses. A case study often includes multiple methods of data gathering [52]. In our study, information was gathered through qualitative interviews, observations during meetings and activities, small-scale surveys, mapping. We also studied websites published by the initiatives, printed material and grey literature. The interviews were transcribed, coded and analysed with NVivo. To get an overview of the potential for energy production and energy saving, we did quick scans of the natural and built environment of the communities

Case setting

In the period 2010-2013, we analysed the activities of thirteen local community energy initiatives in the North of the Netherlands. All initiatives consisted of volunteering citizens. We contacted these initiatives at regional information meetings on the subject of local energy production. These community groups have diverse backgrounds, but tend to converge as to their goal of promoting local energy production. They range from political parties, commercial ventures, and energy cooperatives, to village working groups. An overview is provided in Table 1.

They are set within villages or cities that differ widely as to population size. The smallest initiative in our sample (#9 Wessinghuizen) is set in a community of only 28 inhabitants, whereas the largest one (#4 Groningen) is in a city of 200 thousand. Nine of the thirteen initiatives are set within a village of less than 2,000 inhabitants, and three in a village with a population between two and twenty thousand.

They are located in different geographical landscapes and focus on various energy technologies. Two of the initiatives (#4 Groningen and #11 Franeker; 15%) are in an urban landscape. However, most (85%) are in a rural landscape. With 54% of the cases, there is an open landscape, and the remainder is evenly split along wooded and mixed landscape. One initiative (#5 Oldehove) is set within a UNESCO heritage landscape. As to the technologies applied, we find that solar energy (mainly PV) is used in nine of the initiatives (69%). Biomass is used in four (31%). Furthermore, in six initiatives (46%) energy efficiency is a point of attention. In case #5, the sustainable use of water is part of the initiative as well.

In the remainder of this article, we primarily focus on the ambitions, activities and organisation of local energy initiatives.

Nr.	Location	Population	Landscape	Technology
1	Balinge	110	Wooded Rural	Biomass
2	Hooghalen	940	Wooded Rural	Sun PV Efficiency
3	Westerveld	19,176	Wooded Rural	Sun PV Efficiency
4	Groningen	200,000	Urban Open	Sun PV
5	Oldehove	1,659	Rural Open	SunPV Biomass Water
6	Pekela	13,449	Rural Open	SunPV
7	Pieterburen	375	Rural Open	SunPV Efficiency
8	Schouwerzijl	100	Rural Open	SunPV Efficiency
9	Wessinghuizen	28	Rural Mixed	Biomass
10	Zuidhorn	6,816	Rural Open	SunPV SunThermal
11	Franeker	1,214	Urban Open	Efficiency
12	Makkinga	1,039	Rural Mixed	SunPV Biomass SunThermal
13	Oenkerk	1,800	Rural Mixed	Sun PV Efficiency

Table 1. Descriptive information regarding thirteen local community energy initiatives in the Netherlands

Framework for analysis

In our analysis, we specifically look at two dimensions as outlined in Law and Callon [38]: relations with outside networks and commitment of members. The relations with outside networks are the channels through which multiple actors influence each other, thus co-producing the result of the undertaken project. Therefore more and stronger attachments lead to more influence on a successful outcome of the project. Secondly, the actors have to be committed to the project to achieve the best results. This ties in with team-work literature, which points to motivation of team members as a decisive factor in achieving team goals. Thus, we analyse how these two dimensions influence the effectiveness of local energy initiatives [38].

As to relations with outside networks, we investigate local energy initiatives as embedded and interlinked networks. The local network consists of the energy initiative itself, as well as its relations to other local organizations, such as schools, the municipality, sports, local economic actors (shops, restaurants, farms). The outside network consists of all existing organisations that could be related to the local initiative, such as regional intermediary organisations, national networks, governmental agencies, and incumbent companies. Hargreaves et al. and Parag et al. investigated intermediaries and the maintenance of networks for community initiative in the UK [31,61]. The degree of attachments of local actors to this outside network, is expected to influence the effectiveness of the initiative. To this extent, we investigate members' individual networks, relations to relevant regional and national support systems, relations to existing energy actors (incumbents) and national policies.

As to commitments, we investigate the commitment of local actors along three dimensions: organisation development, existence of a shared vision and level of activities. Following the literature on team effectiveness, we expect a more successful initiative when the internal processes are functioning in such ways that trust and sustainable leadership are guaranteed [45]. We first looked at *organisation development*, which in our cases often meant evolving from an ad hoc working group to a more formal organisation type. For a sustained participation in team activities several aspects are taken into account, such as the continuity of membership, the number of active members and the amount of time members can and will spare for common activities. Strength and clarity of vision is a second aspect of commitment. From the literature (e.g. [45] and [62]) we derive the expectation that a strong *shared vision*, made concrete in practical steps, is an important factor in determining organisational success. Seyfang et. al. also mentions the importance of a shared group vision, group structures, as well as commitment of individuals [62]. The third aspect of organisations that we focus on is the *level of activities*, which we identified in interviews, communications and websites. The level of activities is interpreted as an indicator for a high commitment of members.

Summarizing, the resulting conceptual model based on Law and Callon [38] holds that local energy initiatives can be situated along two dimensions: Attachments to outside networks and commitment of members. On the basis of this conceptual model we have analysed our cases. The results are provided in the next section.

4 Results

In this section we present and discuss the findings of the thirteen case studies, developed along the lines of our conceptual model. We first discuss the attachments of the local initiative to outside networks, and then investigate if the level of attachments influences local achievements. Subsequently, we look at the degree of commitment of local actors to the project, and the possible ways in which this affects local

achievements. Table 2 gives an overview of the results of the analysis of the data for the thirteen local community energy initiatives in the Netherlands.

#	Dimension 1	Dimension 2		
		1. Organisation development	2. Shared Vision	3. Level of activities
1	Global and local network links - collaboration with nature agency -municipality -schools in nearby villages	small informal village initiative with local leaders.	Individual systems with biomass heaters and sun thermal installation.	-Collective (monthly) harvesting in nearby wood -energy education in schools
2	-Village Hall, -municipality, -local school -regional welfare organization -Regional environment organisation -energy engineering (through individual members)	formal 'Stichting' with a board and five workgroups.	Energy neutral village in 2020	-Energy fair -Survey -Website -Social media -Courses SunPV & energy efficiency for home owners -Participation in technical research projects
3	-CE-engineering bureau (through individual members)	A local political party, Progressief Westerveld, drives the initiative in the municipality of Westerveld.	Adopted fund and action plan on community energy actions	-Communication -Advisory role to municipality -Policy documents -Website
4	-Cooperation with initiatives Fryslan and Drenthe -municipality -national links with e-decentraal - energy incumbents (Shell, Gasunie) through individual members)	co-operation 'Grunneger Power' formed in april 2011. -local initiatives can attach themselves to GP, as a local branch.	Renewable energy and local economy	-PV projects -PV advice -Establish green energy provider
5	-Gasunie (through individual members) -Groningen (province)	-Local Sustainable Energy Firm (LDEB) on commercial basis -board with regional experts.	supply energy in the whole of Middag-Humsterland and wider region.	- Funding from the Province of Groningen to set up an organization
6	Municipality, province Groningen, GReK	Formal Stichting with board	CO2-or energyneutral village	-PV-project -information meeting -Facebook page -press -survey
7	-participating in Duurzaam Pieterburen, -Dorpshuis Pieterburen -municipality	formed out of a protest group 'Pieterburen Tegengas'. -local leadership	Renewable energy-village Against underground storage of CO2	-Information meetings
8	-regional networks through individual members	Informal working group under aegis of Village organization (Dorpsbelangen)	Promote individual actions to reduce CO2-emissions	-Series of meetings about home insulation, solar panels and other new options to save energy and produce your own.
9	- funding organisation (Heidemij) through individual members	Successful small-scale initiative plans to supply houses with from the direct	Renewable energy	- Promotion of pellet stoves

	-nature organisation	environment.	Social cohesion	-Installation of PV
10	-municipality	Municipal working group	Not yet determined	In preparation
11	-municipality	Small local working group, with representation of local stakeholders	Strengthen inner city by advising owners of historic buildings on energy improvements	-Information meeting,
12	-municipality -local private sector -school -village organisation	SLIM- subsidized project for three years.	Sustainable village: economic, energy, agriculture, food production,	-building solar thermal installations, -promoting solar panels, -village kitchen garden. -Plan to incorporate energy from biomass plant on farm outside village.
13	-municipality -province	Village initiative started in 2011, informal working group co-operation sustainable energy	mission to become energy neutral in 2050.	-Plans include collective purchase of solar panels -promoting energy efficiency

Table 2. Overview of the results of the case studies

4.1 First dimension, relations with outside networks

Our first dimension, relations to outside networks, is described in this section. Table 2 shows that with eleven initiatives (85%) there is a relationship with the local or regional government (municipality, province). Seven initiatives (54%) have a relation with other community groups (schools, village communities). With six initiatives (46%), we observe there is a direct relationship with the business community. With four initiatives (31%) there is a contact with a regional or nation non-governmental organisation. This adds up to more than 100% as the initiatives have multiple relations.

Every actor in a network is in turn also part of other networks. In the local initiatives we studied it was apparent that many members were engaged in diverse networks and brought in knowledge and opportunities that their attachment to these other actors provided. One obvious attachment members have is to their employer. Some examples of relevant job activities on regional or national level of agents in our cases are the following:

- membership of municipal board (#13),
- provincial civil servant specializing in energy policy (#13),
- director of energy advisory business (#2)
- engineer with energy research institute (#3),
- policy advisor with national gas institute (#4, #5),
- employee at regional support organisation with energy as main focus (#2).

We observe that people employed in the energy sector are voluntary engaging in local initiatives. We also find that in several instances group members have an energy related education. A similar observation is reported by Schwencke et al. [63]. Furthermore, we regularly find small locally based companies, active in the field of renewable and sustainable energy, that participate in the local initiatives (cases #2, #5, #11).

Other relevant competences that members contributed to the initiative were related to finance and communication.

Organisations in the direct vicinity form a part of the network. Members with an affiliation to local organisations can reach out to small businesses, municipal government, local farmers, or the parents of schoolchildren to join the initiative and take part in activities. In our cases there was considerable involvement from local businesses (cases #2, #4, #5, #7, #12, #13), farmers (cases #5, #12), hotels or camping sites (case #2), and schools (cases #1, #2).

Regional environmental organizations as well as provincial village organisations are increasingly active in organizing meetings for local initiatives to meet each other, to share experiences and to obtain information and advice. These meetings attract a lot of attendees from local initiatives. All initiatives in our sample regularly take part in this kind of regional activities.

On a *national level* organisations for lobbying and networking have been set up in the Netherlands. These have been initiated by environmental organisations, by provincial village organisations and by the energy initiatives themselves. This means there are now three national networks of local energy initiatives: *HierOpgewekt*, *Netwerk Duurzame Dorpen*, *E-decentraal*. Their activities range from organizing meetings to lobbying national policy. *E-decentraal* played an active role in the negotiations for the national energy covenant (*Energieakkoord*), so the influence of local initiatives on national policy is growing. [64]

4.2 Second dimension, degree of commitment of local actors

In this subsection we focus on our second dimension, degree of commitment of local actors to the project. We subsequently discuss the results on organisation development, shared vision and level of activities.

4.2.1 Aspect 1: Organisation development

Teambuilding literature [45,65,66] shows that organisations are more successful if trust and sustainable leadership are guaranteed. Seyfang et al. show that community energy groups in general have considerable trouble to survive. Furthermore, their findings suggest that the development of more formal organisation structures could be conditional to achieve group objectives [62].

Table 2 shows that most initiatives are relatively small and informal (5, i.e. 39%). Table 3 gives an overview of different types of commonly used organization structures and how the thirteen cases can be mapped along these types.

Organisation Type	Cases
Working group with the specific purpose to promote community energy	#1, #11, #12
Working group attached to other groups already operating at the local community level	#7, #8
Working group attached to political party	#3, #10
Foundation with the specific purpose to promote community energy	#2, #6
Cooperative to produce and distribute local energy at the community level	#4, #13
Commercial venture	#5

Table 3. Taxonomy of the ways of organizing local community energy initiatives (from less formal to more formal)

Community initiatives are dynamic. For example, one of the initiatives (#2) grew in size from 5 to 25 active members in one year. Typically, they initiatives with highly committed members, stimulating leadership and multiple activities go through a formalisation process after a period of six months to two years.

The initiators in the majority of cases started with an *informal working group* in close cooperation with the local village organisation (for a review of social entrepreneurship in relation to social networks, see [67]. In some instances, for example in case #3, the organisational route was via a local political party.

Others set up a *foundation*, i.e. a more formal organisation, to advance its goal of promoting renewable energy (#XX).

A *co-operative* is a type of organisation in which members can collectively own an energy company, however the financial risks and legal difficulties in setting up such a collective business proved a formidable barrier for many of the small initiatives in our study. The co-operations that were formed often chose to align themselves to a larger energy company with a strong inclination for sustainability, such as *Greenchoice* or *Trianel*. Recently, new regional umbrella energy co-operatives have now been formed. They provide local initiatives with the opportunity to join a strong regional cooperation, while preserving their local autonomy as well as receiving any profits from customers in their constituency.

In our sample we find only one initiative that established itself as a commercial venture. However, Walker et al. [15] points to lack of trust when commercial interests prevail.

In addition, we find that local leadership is very important in the choice of organisation type, also consistent with the findings of Schwencke et al. [63]. The original initiators in our cases largely determined the organisational structure of the initiative.

An additional observation regards the gender aspect of the energy initiatives. In our sample, with 10 initiatives (77%) the initiator was male. In four cases (31%) the whole group consisted of men, while the other initiatives were more gender balanced. This gender aspect needs more attention, which at present is outside the scope of our research.

4.2.2 Aspect 2: Shared vision

A strong shared vision, made concrete in practical steps, is supposed to strengthen the commitment of members to the organisation, as outlined in teamwork literature [45], as well as Seyfang et al. [33]. Table 2 shows that in eleven cases (85%) renewable energy is a shared vision. On top of this, we observe that with six initiatives (46%) community objectives are part of the vision as well. Sustainability explicitly plays a role in three initiatives (23%). One initiative has primarily a commercial objective. And with one initiative, there also is a protest involved against the underground storage of carbondioxide. Hence, most initiatives are of a 'please in my backyard' nature.

In our sample, the visions developed by the local initiatives differ in scope and ambition. On the one hand, the modest ambition could be to stimulate energy efficiency measures and installation of solar PV panels in the village (#7, #8). After organizing several meetings in the Village Hall about the technical and financial aspects of solar PV, often resulting in a surge of installations in the village, the ambition was considered to be fulfilled and the group was disbanded. At the other end of the spectrum, one local initiative (#2) has the ambition to become an energy neutral village in 2020, meaning that the village produces as much energy as it consumes on a yearly basis. A tentative scenario of how to reach this ambition was developed.

In the field of energy transition technical appliances and energy infrastructures are often an important component of the vision. In theory, there are many technological options to decentralize energy production. However, in (Dutch) practice, the actual choice is severely limited by policy constraints. For example regional energy policy in the North of the Netherlands does not allow local windmills [68,69]. This means that local energy coops do not have the opportunity to invest in a cooperative village windmill. Another example concerns biomass installations, which are restricted to farmers, so again this technology is not within reach of most local initiatives. This leaves the local groups with primarily individual installations, e.g. combined heat and power installations and solar panels, as the most promising feasible ('legal') technologies. The recent fall in prices for solar PV has helped to bring 'prosumerism' within reach. Small-scale use of biomass (e.g. by using wood pellets and woodchips) is another possibility on the individual level. Visions of the initiatives in our sample reflect this limited array of possibilities. Solar PV, insulation, and similar household scale measures are paramount in these visions, whereas plans for cooperative energy production with local facilities on a village scale rarely appear.

Not only prices of the appliances matter, also facilities to share or feedback excess energy play a role in inhibiting or stimulating the choice for a certain technology. In the Netherlands, fiscal arrangements generally do not favour small-scale energy production [70]. Therefore, installations in and on private houses, combined with energy efficiency measures, turned out to be the most popular option for local initiatives. Recently, the Dutch Energy Covenant facilitates small tax deductions for community energy projects.

4.2.3 Aspect 3: Level of activities

Table 2 (last column) shows the initiatives display a wide spectrum of activities. With eight initiatives (62%), we witness education and information activities, such as energy markets, information meetings, house-to-house surveys. Other activities range from harvesting biomass to organizing a fair, advising the municipality, trying to get funding, and demonstration projects. Also social media, including websites, twitter accounts and Facebook pages, are used by the initiatives.

When looking at the Netherlands in general, we observe that the *level of activities* with local energy as a topic has grown enormously since 2010. A search in LexisNexis on Dutch words (e.g., *lokale energie coöperatie*, *lokale energie informatie avond*) delivered 300 news articles, after removing double and irrelevant clippings. The first information meetings mentioned in the newspapers took place in 2010, the amount of meetings grew in 2012 and 2013, and in 2014 it is possible to visit a local meeting on energy issues almost every week. The agenda of these meetings usually includes discussions regarding the installation of solar panels, collective wind energy, energy efficiency measures, and the launch of a local energy cooperative. Earlier clippings more often mention involvement of the municipality. Against this background we were present as observer at several such information meetings of the initiatives in our sample. Turnout for these meetings is relatively high; we witnessed numbers of attendees ranging from 35 to 65, in villages of less than 500 inhabitants.

Internet is an important communication tool for local organisations. The majority of the local groups in our sample created a website, and/ or a Facebook page, and often use other social media, such as Twitter. This is also the case for the initiatives mentioned in the newspaper articles, as far as could be retrieved. However, a full investigation of the impact of social media in local energy initiatives lies outside the scope of this paper.

Reflections

Regarding the dimension 'level of attachments to outside networks' our findings suggest that

attachments to local, regional and national networks are continually developed and updated. These attachments also include informal ties, such as through the occupation of members in the energy and/or governmental sector. The community energy field is very dynamic, as is also reported by Hargreaves et al. [31. 32]. They conclude there is as yet no ‘coherent, robust and strategic community energy niche’, while questioning if such a niche would be a desirable goal.

With regard to the second dimension, ‘commitment of members’ our findings give insights in grassroots organisation structures. A transformation from loosely connected individuals in an informal working group to a formal organisation such as a co-op is observable in multiple cases in our sample. Seyfang et al. [62] also report this finding in their UK-wide survey.

A shared vision, put forward as an important condition for team-success, appears to have a binding role in these initiatives. The connection of organisation development and shared vision should be further researched. While in grassroots initiatives the vision is often not very detailed, in municipal energy plans the description of goals is often elaborated in more detail.

A high level of activities is interpreted here as a sign of the commitment of members to the local initiative and its goals. We saw a sharp rise of activities in the Netherlands in general, as well as in our cases. However, due to time-constraints and other competing issues, it is a challenge for citizens initiatives to continue on this high level [8].

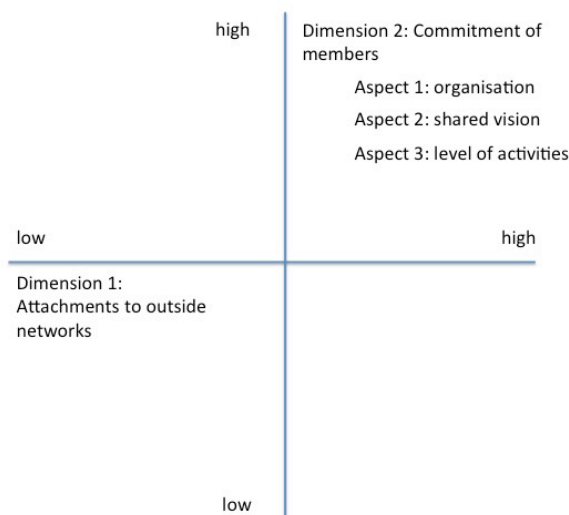


Figure 1. Conceptual framework for the analysis of local community energy initiatives

5 Conclusion

In the Netherlands, we observe an active and growing number of local community energy initiatives. They increasingly cooperate on a regional and national level. New modes of organisation are developed to realize local vision and ambition. In this study, we focus on the social aspects of these initiatives and leave the technological issues aside.

Our key question ‘How can local community energy initiatives contribute to a decentralized sustainable energy system’ guided us in investigating local level dynamics. On the basis of a case study among thirteen local community initiatives in the northern provinces of the Netherlands in the period 2010-2013, we detect there is a wide variety of forms in which local community energy initiatives have organized

themselves, ranging from very informal to quite formal. We provide the first application of Actor-Network Theory regarding how such initiatives relate to more overarching networks. We also provide the first account of local community energy initiatives in the Netherlands, a country that ranks very low within Europe regarding the role of renewable energy production. The main limitation of this study is that the type of local community initiatives studied is relatively young. As a result a database with validated key characteristics and performance measures is missing and we cannot complement our qualitative analysis with a quantitative assessment.

We find that the creation of a committed local organization, with a shared vision and concrete goals is at the start of the change process. Many local initiatives went through a formalization process, which in turn strengthened the organization. Furthermore, the level of activities, including communication efforts, is an important indicator of local team effectiveness. To be successful, local organizations need to entertain strong and continuous relations both on the local as well as on the global level. Increasingly regional and national organizations are formed that connect and represent the local initiatives. We find that local community energy initiatives face the same non-technological challenges as those faced by initiatives from municipalities and cities. These include financial and legal challenges, but also organizational challenges, such as safeguarding continuity, exercising effective team leadership, and attracting membership. Furthermore, they require regular communication with their local environment and securing municipal and/or regional support. Also, the members of these initiatives have to familiarize themselves with technological options. The major difference with other types of local initiatives (e.g. as discussed in 22, 35, 46, 47) is that the local community energy initiatives clearly prioritize community benefits. In many respects, decentralized renewable and sustainable energy production appears to be a means to the end of improving social coherence.

Our study suggests that local community initiatives in the northern Netherlands are emergent organizations. Consistent with the expectations based on Actor-Network Theory we find that the first dimension, relations with outside networks, is important indeed. Relations on the local level determine partly the local support of local government, local economic actors, schools and other local constituencies. The embeddedness of the local organization in regional and national energy networks gives inspiration, information and support. The second dimension, commitment of the members of the local organizations, is a prerequisite for continuity and local effectiveness. A process of *organisation development*, from less to more formal, can be seen in many instances. The local emergent organization undertakes activities and uses websites and social media. This enforces its embeddedness in the community. The higher the local commitment, the higher will be the level of activities. On the second aspect of member commitment, *shared vision*: we find that members of the initiatives share rather general or superficial views on energy neutrality and the development of low-carbon village development. However, what is often lacking are more developed local visions with clear energy goals. In the municipal energy plans on the other hand the vision was more elaborate, however in those cases the active engagement of citizens was lacking [46]. Combining these two strengths might enhance effectiveness of community energy governance. The third aspect of member commitment, the *level of activities*, is the most promising one; hundreds of activities are carried out by these initiatives. Challenges for the future are continuity of involvement, time spent on organizing activities, keeping members on board and keeping the village interested [8,15].

In all, we conclude that community energy initiatives are an emergent phenomenon that in the present stage provides a useful grassroots approach for many citizens to engage in the transition to a sustainable energy future. However, our research suggests that further development of organisation structures and viable visions for local energy governance is necessary to achieve lasting results.

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